Extended Abstract
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Paper Title	Assessing Scotland's self-sufficiency of major food commodities

Abstract prepared for presentation at the 98th Annual Conference of The Agricultural Economics Society will be held at The University of Edinburgh, UK, 18th - 20th March 2024.

Abstract	***200 words max***

Achieving food self-sufficiency has gained prominence in the present policy agenda to increase resilience to adverse events and lower food's resource footprint. Using a novel approach, we estimated Scotland's food balance sheets and assessed the self-sufficiency of major food commodities. We also assessed the contribution of domestic production towards nutrient security. Data from 2003 to 2019 were obtained from Economic Reports on Scottish Agriculture and the Department for Environment, Food and Rural Affairs (DEFRA) Family Food statistics. According to our findings, Scotland is a net exporter of cereal, potatoes, beef, dairy, and eggs, and is self-sufficient in these. However, it relies on imports of poultry and pork. Wheat and dairy sourced from Scotland play crucial roles in the food supply chain, markedly influencing total energy, dietary protein, and primary dietary fat sources. Our assessment forms a basis for evidence-based decision-making in Scotland's agricultural and food policy. It provides insights into where investments and support may be needed to enhance domestic production and promote a resilient and sustainable food system. The method used in this study could be used in future studies to estimate regional-level food self-sufficiency in the absence of trade and complete food balance sheet data.

Keywords	Food systems, food balance sheets, self-sufficiency, sustainability
JEL Code	Q18

Introduction	***100 – 250 words***

Achieving food self-sufficiency has been acknowledged as a means of boosting resilience to adverse events, and reducing the resource footprint of food is currently moving up the policy agenda in many countries. Recent global events such as the 2007–2008 food price crisis, the impact of the COVID-19 pandemic on the global food supply chains, and the Russia-Ukraine war have spurred discussions on global food market volatility, the resilience of disconnected agri-food systems, and regional food self-sufficiency. In this context, analysis of regional-level food self-sufficiency is thought to help to better understand a country or region's dependency on, and vulnerability to, the food system. However, up to this point, research has mostly looked at country/nation-level food supply, self-reliance, and self-sufficiency. Only a very few studies have focused on local/regional food self-sufficiency and self-reliance.

Since regions are a part of both a national and supranational political and institutional framework, there are less data available to evaluate their food security status. This lack of data has resulted in a lack of studies dedicated to exploring local and regional food self-sufficiency. Therefore, our paper introduces a method to bridge this data gap. In this paper, using this approach we estimate the food balance sheets (FBS) of Scotland, the second-largest

region in the United Kingdom, and assess the self-sufficiency of major food commodities, wheat, barley, oats, potatoes, poultry, beef, pork, lamb, dairy, and eggs. We also assess the supply of energy and macronutrients for major food commodities and the contribution of Scottish production to nutrition security in the last two decades.

Methodology

100 – 250 words

Data

Domestic production, net stocks, Scottish food, seed, feed, and other data for each commodity were obtained from Economic Reports on Scottish Agriculture. Food purchase data for Scotland were collected from the Department for Environment, Food and Rural Affairs (DEFRA) Family Food statistics, including 167 final food products. They were back-transformed into the corresponding annual consumption of primary commodity equivalents using the food conversion factors. Food import and export data are not readily available for Scotland. Therefore, we developed a consumption-based approach to estimate the net trade values of each commodity.

Procedure

The procedure employed in this study consisted of three steps.

Even though FBS are available for the UK, the FAO does not estimate the FBS for Scotland. Therefore, we first constructed the annual food balance sheets for the above major food commodities in Scotland from 2003 to 2019 using the United Nations' Food and Agriculture Organization (FAO)'s FBS approach. We also derived the per capita food availability of each commodity.

Next, we estimate the self-sufficiency ratios (SSR) of major food commodities. The SSR measures the extent to which a country can satisfy its food needs from its domestic production. Following the FAO's definition of food self-sufficiency, we estimated SSR as below:

$$SSR = \frac{Scottish\ Production}{Scottish\ Production + Net\ trade + Net\ stocks} \times 100$$

Third, using the conversion factors published by FAO, we estimated the supply of energy and macronutrients (protein and fat) from the major food commodities. Further, we assessed the contribution of Scottish production to nutrition security in the last two decades.

Results

100 – 250 words

Between 2003 and 2019, wheat and oats production increased significantly. Egg production saw the highest rise among major commodities. Pork production halved, and poultry production dropped by 30%. In Scotland, dairy and egg consumption was the highest, while barley, oats, and lamb consumption were the lowest. Consumption of barley and wheat has decreased. Oats, however, showed a marked increase in consumption (~27%). Scotland is a net exporter of barley and oats. Since 2003, Scotland had a net trade surplus of potatoes and became a net importer of wheat since 2012. Scotland is a net exporter of beef but a net importer of pork and poultry. Scotland is also a net exporter of dairy products, and it turned from a net importer to a net exporter of eggs in 2014, marking a notable turnaround.

Cereal SSR is consistently 100 or above, showing robust production meeting consumption. Potatoes' SSR is around 128, consistently surpassing consumption. Meat products' SSR ranges from 26 to 146, with fluctuations influenced by imports and seasons. Dairy SSR is around 112, indicating slightly more production than consumption. Eggs maintain an SSR of around 102,

meeting consumption needs. Wheat plays a key role in the energy supply, largely sourced from Scotland. Potatoes are also an important source of energy, and the entire supply comes from Scotland. Meat products, rich in protein and fat, have varying proportions from Scottish sources. Dairy products and eggs, major contributors to protein and fat supply, are entirely sourced from Scotland.

Discussion and Conclusion

100 – 250 words

Based on our study, production of wheat, oats, and egg output has seen an increase, whereas pork and poultry production declined, between 2003 and 2019. Additionally, consumption of wheat, barley, and red meat decreased during this period. These trends are encouraging in the context of sustainable food consumption in Scotland, given that red meat production has a higher emissions footprint per calorie produced compared to other food items. We also found that Scotland is self-sufficient in cereal, potatoes, lamb, beef, dairy, and eggs but relies on imports for poultry and pork. Our analysis of nutrient security indicates that wheat and dairy sourced from Scotland play crucial roles in the food supply chain, markedly influencing total energy, dietary protein, and primary dietary fat sources.

Our findings on production, consumption, net trade, and self-sufficiency provide an understanding of the situation of the aggregated Scottish food security. Understanding food supply patterns can aid in dietary planning, food security considerations, and supporting local agricultural production. It offers insights into where investments and support may be needed to enhance domestic production and promote a resilient and sustainable food system. Estimated self-sufficiency ratios provide a more accurate assessment of the extent of food localization in Scotland. The method used in this study has the potential to be used for the estimation of regional-level food self-sufficiency even when regional trade data and food balance sheets are unavailable.